

REMARKS

Claim 1 has been amended. Claims 3, 4, 6, 9-11 have been canceled herein. Claims 1, 2, 5, 7 and 8 remain pending in this application.

I. Rejection of Claims 1-2, 4-7 under Section 102

Claims 1-2, 4-7 and 9-10 stand rejected under Section 102 as being anticipated by U.S. Patent No. 6,253,829, issued to Mashiko. The office action states that Mashiko teaches the steps of providing a tubular pipe, casting molten metal around it, adding a working fluid to the pipe and then sealing the pipe. See Fig. 28 and Col. 16 lines 5-31 and Col. 15, lines 55-60.

Applicant's original Claim 1 called for "forming a thermally conductive material" around the tubular pipe. Original claim 3 required that the material for overmolding is a thermally conductive polymer. The limitations of Claim 3 has now been incorporated into independent Claim 1. Accordingly, Claim 3 has now been canceled. Claim 1 now requires that a thermally conductive polymer composition be overmolded over the pipe. Claim 1 also requires that the thermally conductive polymer composition be filled. See page 4 of the specification, lines 12-14, for support for this amendment. Claims 4, 6 and 9-11, relating to casting a metallic material, have been canceled. Therefore, Claims 1, 2, 5, 7 and 8 remain which related to overmolding a filled thermally conductive polymer composition about the heat pipe tube prior to charging it with media.

In view of the foregoing amendments to the Claims, Applicant submits that the Mashiko '830 cited reference is not applicable because Mashiko discloses the casting of molten metallic material rather than overmolding a filled thermally conductive polymer composition about the heat pipe chamber. Therefore, under Section 102, Mashiko fails to anticipate Applicant's invention as in the claims, as amended.

II. Rejection of Claim 3 under Section 103

Claims 3, 8 and 11 stand rejected under Section 103 as being unpatentable over Mashiko et al. Claim 3 is directed to overmolding a thermally conductive polymer composition about the empty heat pipe tube.

The office action states that Mashiko teaches the method as claimed except for the step of overmolding a thermally conductive polymer composition over the heat pipe. Mashiko does teach the step of casting a molten metallic material about the heat pipe before it is filled. The office action states that, in light of the teaching of Mashiko, the use of a thermally conductive polymer composition is an obvious variation of the molten metallic material employed by Mashiko.

The limitations of Claim 3 have now been incorporated directly into independent Claim 1 along with the further limitation that the thermally conductive polymer composition be *filled*. As a result, Claim 1 now requires a specific step, namely, "overmolding a thermally conductive filled polymer composition around said tubular pipe". This is in direct contrast to the step of casting of a molten metallic material about the tubular heat pipe which is disclosed in Mashiko.

The claims in the instant application call for a *method of manufacturing* a heat pipe not the apparatus of the heat pipe itself. Perhaps, in the context of a heat pipe *article*, a purely metallic material disposed about a heat pipe may suggest or render obvious a similar heat pipe article that has a thermally conductive polymers composition disposed about the heat pipe. However, the respective *methods* of manufacturing the heat pipe construction are completely different than one another.

More specifically, Mashiko's method requires the *casting* of molten metallic material, such as copper, about the unfilled, hollow heat pipe tube. Metal is very viscous, heavy and dense when in a molten, castable form. For example, molten copper has a density of approximately 0.323 lbs/cu-inch. Therefore, in order to form an article

from this sludge-like material, it must be handled at very high pressure and at very high temperature. See Col. 10, lines 12-23. These temperatures, for example, could exceed 1500°F, which is the melting point of copper. Once the molten metal is forced into the mold, it is left in that state for a predetermined amount of time to permit the molten metal to solidify. As can be understood, due to the high temperature and density of the material, it may take several minutes, perhaps over 30 minutes, for the metal to solidify to a point where the mold can be removed. During this casting method, the high temperature and pressure dramatically increases the chances of damaging the hollow heat pipe tube, which is often made of a thin and delicate aluminum material.

To further enhance the thermal transfer capabilities of the heat pipe construction, Mashiko insert casts heat dissipating fins 8 to the base 7 which surrounds the heat pipe. The casting method, using molten metal, selected by Mashiko requires that these additional heat transfer enhancement structures, e.g. fins, be very simple in arrangement and configuration so that they can be effectively cast around. As a result, Mashiko's casting method is incapable of forming more complex pin and fin geometries to greatly improve the efficiency of the heat pipe construction by mere design improvements in the geometry. Due to the use of casting metal, Mashiko's ability to engineer the geometry of the pins and fins is significantly limited and, therefore, must rely on the bulk heat transfer of the metal base and simple fins with the added improvement of the interior heat pipe.

Due to the use of large volumes of cast molten metal material to achieve the desired thermal conductivity, Mashiko's method results in a heat pipe construction that is extremely heavy. Such heavy weight poses shock and vibration issues within the environment into which the construction is installed. Thermally conductive adhesive is typically inadequate for securing a cast metal heat sink device to an object to be cooled, such as a microprocessor chip. Such devices require large bolts to secure the device in place. Moreover, these cast metal heat sink constructions are often completely

inappropriate for certain environments, such as within personal computer cases, particular ones that stand vertically where the heat sink construction is constantly under the pull of gravity. These heavy metal construction are particularly problematic during shipping, not only for movement but the added cost due to the weight.

In contrast, Applicant's invention requires a method that employs the *overmolding* of a thermally conductive filler polymer material, as in Claim 1, as amended. This method is fundamentally different than the casting method taught by Mashiko. A moldable typically thermally conductive plastic with thermally conductive filler therein, has a density of, for example, 0.052 lbs/cu-inch which is over six times less dense than molten metal. As result, the overmolding process, such as by injection molding, need not employ the high pressure required by Mashiko to push molten metal.

Since Applicant's invention employs a polymer composition for surrounding the heat pipe, much lower temperatures are required for operation compared to Mashiko. For example, a typical polymer composition melts and is flowable and moldable at temperatures as low as 400°F as compared to the 1500°F required for the molten metal only.

The light weight, low density, low temperatures and formation method provides the method of the present invention with significant advantages over the prior art. The significantly lower temperatures enables the cycle times of manufacture to be greatly reduced compared to casting metal. For example, cycle times for parts made from polymer compositions may be as short as a few minutes or even less. With Applicant's method, more parts can be manufactured faster with the same mold. The lower weight greatly improves shock and vibration performance resulting in a cooling device that is less susceptible to failure.

Further, the method of overmolding a thermally conductive polymer composition that is filled enables a finished heat sink device to be formed that performs similar to a

metal only heat sink but without the weight, shock and vibration issues and long cycle times. Since Applicant's method employs a thermally conductive polymer composition that is overmolded, the heat transfer enhancement structures, such as pins or fins, can be made more complex to suit the application at hand. See Specification, paragraph 14. These auxiliary heat dissipating structures can be integrally formed with and at the same time at the base portion of the device. See Specification, paragraph 20, lines. Thus, a unitary integrated heat transfer device with a heat pipe embedded therein can be achieved with Applicant's method not the metal casting method taught by Mashiko.

The office action also suggests that Mashiko can be modified to overmold a thermally conductive filled polymer composition. Since it is Mashiko that is relied on under Section 103 for the teaching of forming thermally conductive material around a hollow heat pipe tube, Mashiko itself must have some teaching or suggestion to support the position that it would be obvious to simply employ a thermally conductive filled plastic instead of molten metal. Mashiko is completely devoid of such a teaching or suggestion. In fact, Mashiko teaches against the use of a polymer material because its mold apparatus (molds 98, 100 and plunger 14, 17) is not capable molding a polymer composition because of the high pressures and temperatures used. The high pressure plunger would push the polymer material too fast and damage the filler loaded therein. Mashiko fails to teach or suggest that a method, other than casting and a material other than molten metal, be employed.

Claim 8, which is directed to filling the pipe with ammonia, is dependent on now Claim 1. As a result, Claim 8 is now also submitted as being allowable over the cited art. The rejection Claim 11 is moot in light of the cancellation of this claim.

In view of the foregoing, Mashiko et al. fails to render unpatentable Claims 1 and 8 under Section 103.

III. Conclusion

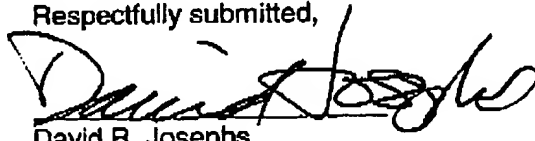
Applicant submits that Claims 1, 2, 5, 7 and 8, as amended, are allowable over the cited prior art. In view of the above, Applicants submit that pending Claims 1, 2, 5, 7 and 8 are now in condition for allowance. Reconsideration of the Rejections and Objections are requested. Allowance of Claims 1, 2, 5, 7 and 8 at an early date is solicited.

If an extension of time is required for timely submission of this response, Applicant hereby petitions for an appropriate extension of time and the Office is authorized to charge Deposit Account 02-0900 for the appropriate additional fees in connection with the filing of this response.

The Examiner is invited to telephone the undersigned should any questions arise.

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Respectfully submitted,



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Revised Notice*
AMENDMENTS MAY NOW BE SUBMITTED IN REVISED FORMAT

The United States Patent and Trademark Office (USPTO) is permitting applicants to submit amendments in a revised format as set forth below. Further details of this practice are described in *AMENDMENTS IN A REVISED FORMAT NOW PERMITTED*, signed January 31, 2003, expected to be published in *Official Gazette* on February 25, 2003 (Notice posted on the Office's web site at <http://www.uspto.gov/web/offices/pac/dapp/opla/preognotice/revamdtpprac.htm>). The revised amendment format is essentially the same as the amendment format that the Office is considering adopting via a revision to 37 CFR 1.121 (Manner of Making Amendments). The revision to 37 CFR 1.121 (if adopted) will simplify amendment submission and improve file management. The Office plans to adopt such a revision to 37 CFR 1.121 by July of 2003, at which point compliance with revised 37 CFR 1.121 will be mandatory.

Effective immediately, all applicants may submit amendments in reply to Office actions using the following format. Participants in the Office's electronic file wrapper prototype¹ receiving earlier notices of the revised practice may also employ the procedures set out below.

REVISED FORMAT OF AMENDMENTS

Begin on separate sheets:

Each section of an Amendment (e.g., Claim Amendments, Specification Amendments, Drawing Amendments, and Remarks) should begin on a separate sheet. *For example*, in an amendment containing a.) introductory comments, b.) amendments to the claims, c.) amendments to the specification, and d.) remarks, each of these sections must begin on a separate sheet. This will facilitate the process of separately indexing and scanning of each part of an amendment document for placement in an electronic file wrapper.

Two versions of amended part(s) no longer required:

The current requirement in 37 CFR 1.121(b) and (c) to provide two versions (a clean version and a marked up version) of each replacement paragraph, section or claim will be waived where an amendment is submitted in revised format below. The requirements for substitute specifications under 37 CFR 1.125 will be retained.

A) Amendments to the claims:

Each amendment document that includes a change to an existing claim, or submission of a new claim, **must include a complete listing** of all claims in the application. After each claim number, the status must be indicated in a parenthetical expression, and the text of each claim under examination (with markings to show current changes) must be presented. The listing will serve to replace all prior versions of the claims in the application.

- (1) The current status of all of the claims in the application, including any previously canceled or withdrawn claims, must be given. Status is indicated in a parenthetical expression following the claim number by one of the following: (original), (currently amended), (previously amended), (canceled), (withdrawn), (new), (previously added), (reinstated – formerly claim #), (previously reinstated), (re-presented – formerly dependent claim #), or (previously re-presented). The text of all pending claims under examination must be submitted each time any claim is amended. Canceled and withdrawn claims should be indicated by only the claim number and status.
- (2) All claims being currently amended must be presented with markings to indicate the changes that have been made relative to the immediate prior version. The changes in any amended claim should be shown by strikethrough (for deleted matter) or underlining (for added matter). An accompanying clean version is not required and should not be presented. Only claims of the status "currently amended" will include markings.
- (3) The text of pending claims not being amended must be presented in clean version, i.e., without any markings. Any claim text presented in clean version will constitute an assertion that it has not been changed relative to the immediate prior version.

¹ The Office's Electronic File Wrapper prototype program is described in *USPTO ANNOUNCES PROTOTYPE OF IMAGE PROCESSING*, 1265 *Off. Gaz. Pat. Office* 87 (Dec. 17, 2002) ("Prototype Announcement"), and applies only to Art Units 1634, 2827 and 2834.

- (4) A claim may be canceled by merely providing an instruction to cancel. Listing a claim as canceled will constitute an instruction to cancel. Any claims added by amendment must be indicated as (new) and shall not be underlined.
- (5) All of the claims in each amendment paper must be presented in ascending numerical order. Consecutive canceled or withdrawn claims may be aggregated into one statement (e.g., Claims 1 – 5 (canceled)).

Example of listing of claims (use of the word "claim" before the claim number is optional):

Claims 1-5 (canceled)
Claim 6 (withdrawn)
Claim 7 (previously amended): A bucket with a handle.
Claim 8 (currently amended): A bucket with a ~~green~~ blue handle.
Claim 9 (withdrawn)
Claim 10 (original): The bucket of claim 8 with a wooden handle.
Claim 11 (canceled)
Claim 12 (re-presented – formerly dependent claim 11) A black bucket with a wooden handle.
Claim 13 (previously added): A bucket having a circumferential upper lip.
Claim 14 (new): A bucket with plastic sides and bottom.

B) Amendments to the specification:

Amendments to the specification must be made by presenting a replacement paragraph or section marked up to show changes made relative to the immediate prior version. An accompanying clean version is not required and should not be presented. If a substitute specification is being submitted to incorporate extensive amendments, both a clean version (which will be entered) and a marked up version must be submitted as per current 37 CFR 1.125.

C) Amendments to drawing figures:

Drawing changes must be made by presenting replacement figures which incorporate the desired changes and which comply with § 1.84. An explanation of the changes made must be presented in the remarks section of the amendment. Any replacement drawing sheet must include all of the figures appearing on the immediate prior version of the sheet, even though only one figure may be amended. The figure or figure number of the amended drawing should not be labeled as "amended." If the changes to the drawing figure(s) are not accepted by the examiner, applicant will be notified of any required corrective action in the next Office action. No further drawing submission will be required, unless applicant is notified.

Any questions regarding the submission of amendments pursuant to the revised practice set forth in this flyer should be directed to the following legal advisors in the Office of Patent Legal Administration (OPLA): Elizabeth Dougherty (Elizabeth.Dougherty@uspto.gov), Gena Jones (Eugenia.Jones@uspto.gov) or Joe Narcavage (Joseph.Narcavage@uspto.gov). For information on the waiver or legal aspects of the prototype, please contact Jay Lucas (Jay.Lucas@uspto.gov), Senior Legal Advisor (PCTLA) or Rob Clarke (Robert.Clarke@uspto.gov), Senior Legal Advisor (OPLA). Alternatively, further information may be obtained by calling OPLA at (703) 305-1616.

* Revised Notice: See Sec. B) for changes relating to substitute specifications, and Sec. C) for changes on replacement drawing practice.